

What is claimed is:

1. A protection arrangement for a line circuit, comprising:  
current sensing means for sensing current flowing through  
the telephone subscriber line;

isolation means for selectively coupling a power supply to the  
line circuit; and

control means for operating the isolation means to decouple  
the power supply from the line circuit in response to a current sensed  
by the current sensing means exceeding a current threshold, and to re-  
couple the power supply to the line circuit responsive to a  
predetermined time interval having passed.

2. A protection arrangement as claimed in claim 1,  
wherein the isolation means comprises:

a FET having a source for connecting to the power supply, a  
drain for connecting to the line circuit, and a gate; and

an interface circuit connected to the source and drain of the  
FET, having an input connected to the control means, and an output  
connected to the gate of the FET, the interface circuit for operating the  
FET in saturation mode to couple the power supply to the line circuit  
and for turning off the FET to decouple the power supply from line  
circuit.

3. A protection arrangement as claimed in claim 2,  
wherein the interface circuit comprises:

a voltage divider having first and second resistors, the first  
resistor connected to the source of the FET at one end and to the gate  
of the FET at the other end, and the second resistor connected to the  
gate of the FET at one end; and

a pnp transistor having a base connected to ground, an  
emitter coupled to the controller means, and a collector connected to  
the other end of the second resistor.

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4. A protection arrangement as claimed in claim 3, wherein the interface circuit further comprises a zener diode having an anode connected to the source of the FET and a cathode connected to the gate of the FET.

5. A protection arrangement as claimed in claim 4, wherein the interface circuit further comprises a capacitor connected to the emitter of the pnp transistor at one end and to the drain of the FET at the other end.

6. A protection arrangement as claimed in claim 5, wherein the interface circuit further comprises a resistor that couples the emitter of the pnp transistor to the controller means.

7. A method of protecting a line circuit connected to a power supply and to a telephone subscriber line from an over-current condition, the over-current condition being defined as when current flowing through the telephone subscriber line exceeds a predetermined current threshold value, comprising the steps of:

- a) checking for a presence of the over-current condition;
- b) starting, responsive to the over-current condition being present, a timer of predetermined duration;
- c) disconnecting, responsive to the timer having expired, the line circuit from the power supply;
- d) waiting a predetermined amount of time; and
- e) reconnecting the line circuit to the power supply.

8. A method as claimed in claim 7, wherein the step (b) of starting further comprises the steps of:

checking, after starting the timer, for the presence of the over-current condition; and

stopping, responsive to the over-current condition no longer being present, the timer and continuing the method from the step (a) of checking.

9. A method as claimed in claim 8, wherein the step (b) of starting further comprises the steps of:

checking, responsive to starting the timer and to the over-current condition being present, for a presence of an over-voltage condition, the over-voltage condition being defined as when voltage on the telephone subscriber line exceeds a predetermined voltage threshold value; and

stopping, responsive to the over-voltage condition being present, the timer and continuing the method from the step (a) of checking.

10. A method as claimed in claim 9, wherein the step (b) of starting a timer further comprises the steps of:

checking, responsive to the over-current condition being present and an over-voltage condition not being present, the timer to determine if the timer has expired; and

continuing, responsive to the timer not having expired, the method from the step of checking, after starting the timer, for the presence of the over-current condition.

11. A method of protecting a line circuit connected to a telephone subscriber line from an over-voltage condition, the over-voltage condition being defined as when voltage on the telephone subscriber line exceeds a predetermined voltage threshold value, comprising the steps of:

- a) checking for a presence of the over-voltage condition;
- b) starting, responsive to the over-voltage condition being present, a first timer of predetermined duration;
- c) disconnecting, responsive to the timer having expired and to the over-voltage condition being present, the line circuit from the telephone subscriber line;
- d) waiting a predetermined amount of time; and

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e) reconnecting the line circuit to the telephone subscriber line.

12. A method as claimed in claim 11, wherein the method further comprises the steps of:

f) checking for the presence of the over-voltage condition;

5 g) restarting, responsive to the over-voltage condition being present, the first timer; and

h) disconnecting, responsive to the first timer having expired after being restarted and to the over-voltage condition being present, the line circuit from the telephone subscriber line.

10 13. A method as claimed in claim 12, wherein the step (e) of reconnecting further comprises the steps of:

starting a second timer of predetermined duration after the telephone subscriber interface circuit has been reconnected to the telephone subscriber line; and

15 continuing, responsive to the second timer having expired and the over-voltage condition not being present, the method from the step (a) of checking.

14. A method as claimed in claim 12, wherein the step (b) of starting further comprises the steps of:

20 checking, after the first timer has been started, for the presence of the over-voltage condition; and

continuing, responsive to the over-voltage condition not being present and the first timer not having expired, the method from the step (a) of checking.

25 15. A method as claimed in claim 13, wherein the step (g) of restarting further comprises the steps of:

checking, after the first timer has been restarted, for the presence of the over-voltage condition; and

30 continuing, responsive to the over-voltage condition not being present, the method from the step of starting a second timer.

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16. A method of protecting a line circuit connected to a telephone subscriber line from positive and negative over-voltage conditions, the positive over-voltage condition being defined as when voltage on the telephone subscriber line exceeds a predetermined positive voltage threshold value and the negative over-voltage condition being defined as when voltage on the telephone subscriber line exceeds a predetermined negative voltage threshold value, comprising the steps of:

- a) checking for a presence of the positive over-voltage condition;
- b) checking, responsive to the positive over-voltage condition not being present, for a presence of the negative over-voltage condition;
- c) starting, responsive to the negative over-voltage condition being present, a first timer of predetermined duration;
- d) disconnecting, responsive to the timer having expired and to the negative over-voltage condition being present, the line circuit from the telephone subscriber line;
- e) waiting a predetermined amount of time; and
- f) reconnecting the line circuit to the telephone subscriber line.

17. A method as claimed in claim 16, wherein the method further comprises the steps of:

- g) checking for a presence of the positive over-voltage condition;
- h) checking, responsive to the positive over-voltage condition not being present, for a presence of the negative over-voltage condition;
- i) restarting, responsive to the negative over-voltage condition being present, the first timer; and

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j) disconnecting, responsive to the first timer having expired after being restarted and to the negative over-voltage condition being present, the line circuit from the telephone subscriber line.

18. A method as claimed in claim 17, wherein the step (f) of reconnecting further comprises the steps of:

starting, after the telephone subscriber interface circuit has been reconnected to the telephone subscriber line, a third timer of predetermined duration;

checking for a presence of the positive over-voltage condition;

checking, responsive to the positive over-voltage condition not being present, for a presence of the negative over-voltage condition; and

continuing, responsive to the third timer having expired and both positive and negative over-voltage conditions not being present, the method from the step (a) of checking.

19. A method as claimed in claim 17, wherein the step (c) of starting further comprises the steps of:

checking, after the first timer has been started, for a presence of the positive over-voltage condition;

starting, responsive to the positive over-voltage condition being present, a second timer of predetermined duration;

disconnecting, responsive to the second timer having expired and to the positive over-voltage condition being present, the line circuit from the telephone subscriber line;

waiting a predetermined amount of time; and

reconnecting the line circuit to the telephone subscriber line.

20. A method as claimed in claim 18, wherein the step (i) of restarting further comprises the steps of:

checking, after the first timer has been restarted, for a presence of the positive over-voltage condition;

starting, responsive to the positive over-voltage condition being present, a second timer of predetermined duration; and

5        disconnecting, responsive to the second timer having expired and to the positive over-voltage condition being present, the line circuit from the telephone subscriber line.

21.    A method as claimed in claim 20, wherein the step of starting a second timer further comprises the steps of:

10        checking, after the second timer has been started, for the presence of the positive over-voltage condition; and

continuing, responsive to the positive over-voltage condition not being present and the second timer not having expired, the method from the step of starting the third timer.

15        22.    A method as claimed in claim 20, wherein the step of checking for a presence of the positive over-voltage condition after the first timer has been restarted further comprises the steps of:

checking, responsive to the positive over-voltage condition not being present, for the presence of the negative over-voltage condition; and

20        continuing, responsive to the negative over-voltage condition not being present and the first timer not having expired after having been restarted, the method from the step of starting the third timer.

23.    A method as claimed in claim 16 wherein the step (c) of starting further comprises the steps of:

25        checking, after the first timer has been started, for the presence of the negative over-voltage condition; and

continuing, responsive to the negative over-voltage condition not being present and the first timer not having expired, the method from the step (a) of checking.

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